



ICAR NAGALAND CENTRE NEWS

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Chief Editor's Column

It gives me immense pleasure that ICAR Research complex for NEH Region Nagaland Centre has brought out the first issue of Newsletter for the period of January- December, 2013 which will definitely play a pivotal role in transferring need based technologies to the farmers for increasing production and productivity. The information so provided will help the Farmers, Extension workers, Non-governmental Organizations, State Agriculture & Allied Departments, Bankers and various other agencies to take up newer programme for Agricultural development in Nagaland.

यह मुझे पूर्वोत्तर पहाड़ी क्षेत्रों नागालैंड केंद्र के लिए आईसीएआर अनुसंधान परिसर निश्चित रूप से बढ़ाने के लिए किसानों को आवश्यकता आधारित प्रौद्योगिकियों के हस्तांतरण में एक निर्णायक भूमिका निभानी होगी, जनुअरी से दिसंबर, 2013 की अवधि के लिए न्यूज़लेट्र के अपने पहले अंक प्रकाशित करने जा रहा है कि एक बहुत खुशी देता है उत्पादन और उत्पादकता जिससे सतत आधार पर कृषि और संबद्ध क्षेत्रों से आय सृजन. इसलिए उपलब्ध कराई गई जानकारी किसानों, विस्तार कार्यकर्ताओं, गैर सरकारी संगठनों, राज्य कृषि एवं संबद्ध विभागों, बैंकरों और कृषि और नागालैंड के मित्र देशों की विकास की प्रक्रिया में अभिसरण दृष्टिकोण को जन्म दे सकती है कि विभिन्न अन्य एजेंसियों को जागरूकता के लिए प्रोत्साहित करेंगे.

Dr. Bidyut C. Deka
डॉ. बिद्युत सी. डेका

Profile

About the Centre

ICAR Research Complex for NEH Region, Nagaland Centre is situated adjacent to NH-39 along the Dimapur - Kohima route, which is about 25 km far from Dimapur having a latitude of 25°45'24"N, longitude of 93°50'26"E, and altitude of 295 m above MSL. The centre is functioning at Jharnapani near Dimapur since 1975. The climate of the region is sub-tropical to sub-temperate sub-humid with the normal annual rainfall of about 1600 mm and normal daily maximum temperature of 27°C and minimum temperature of 20°C with the annual extremes of temperature of 4–38°C. The infrastructure facility includes an Administration Building, a Central Laboratory, an Experimental Farm, a Livestock Farm (poultry, pig, duck, rabbit, and cattle), a Scientists' Home, and a Farmers' Hostel. Three Krishi Vigyan Kendras (KVKs), namely, KVK Dimapur, KVK Wokha and KVK Longleng are under the administrative control of this Centre. KVK Dimapur was sanctioned in 1979 and started functioning in 1985-86; whereas KVK Wokha was sanctioned and started functioning in 2006. KVK Longleng was inaugurated in 2011 and started functioning fully in 2013.

Mandate

- Development of sustainable farming systems for different agro-climatic

and socio-economic zones of the region

- Improvement in the productivity of different crops, livestock and aquatic fauna through the development / screening of varieties and agro-techniques,
- Improvement in rain-fed agriculture through watershed based approach,
- Development of local competence through training on agriculture and allied sectors,
- Development of effective linkages with other line departments, financing agencies and SAUs / CAUs operating in the region,
- To maintain database and act as a repository of information centre on agriculture and allied sectors and to provide consultancy in the above areas including plant and animal biotechnology,
- Germplasm exchange and research update in a collaborative mode with other national and international agencies.

Current Scientific Staff at Centre

Sl. No.	Name	Designation
1	Dr. Bidyut C. Deka	Joint Director
2	Dr. M.K. Patra	Scientist (Animal Reproduction)
3	Dr. A. Thirugnanavel	Scientist (Fruit Science)
4	Dr. Rakesh	Scientist

	Kumar	(Agronomy)
5	Dr. Dibyendu Chatterjee	Scientist (Soil Science)
6	Mrs. Tasvina Rahman Borah	Scientist (Plant Pathology)
7	Ms. Christy B K Sangma	Scientist (Soil Science)
8	Dr. Rajesha G.	Scientist (Plant Pathology)

Infrastructure

Laboratory:

The centre has 6 laboratories, viz. Soil Testing Lab, Plant Pathology Lab, Entomology Lab, Animal Science Lab, Central Lab, Horticulture Lab with the facilities like Kjeltex apparatus with distillation unit, flame photometer, TDR probe, Laminar air flow cabinet, Thermal cycler (PCR), gel electrophoresis apparatus, gel documentation system, micro plate ELISA reader, UV-VIS spectrophotometer, root and leaf analyzer, plant growth chamber, and citrus processing unit.

Research Farm:

The Research Farm of the centre is divided into 6 blocks. The major crops grown are:

Block- 1: Paddy (Lowland) – Mustard/ Linseed-Green gram/Dhaincha

Block- II: Paddy (Lowland) – Maize/
Sunflower/ Buckwheat/ Linseed-
Greengram

Block-III: Paddy (Upland) – Blackgram/
Greengram/ Maize/ Soyabean/
Groundnut

Block- IV: Lemon, Khasi Mandarin,
Peach, Guava, Litchi

Block- V: Jackfruit, Fodder, Tuber crops

Block- VI: Pasture

Besides, the following
infrastructures are available in the farm:

Sl No	Particulars	Area/ unit
1.	Poultry unit	8 No.
2.	Dairy unit	2 No.
3.	Piggery unit	3 no.
4.	Rabbit unit	1 no.
5.	Water harvesting pond	2 No.
6.	Automatic weather station	2 No.
7.	Mushroom unit	1 No.
8.	Vermicompost unit	2 no.
9.	Glass house	2 No.
10.	Poly house	2 No.
11.	Shed Net house	6 No.
12.	Nursery	1 No.

Research Highlights

NRM

Yield Potential of Field Crops:

Important field crops and the average
yield of few promising improved

varieties at Research Farm during the
period of 2013-2014 are listed up:

S.N	Crop	Variety	Yield (t ha ⁻¹)
1.	Paddy	IET -18564	4.8
2.	Maize	RCM-76	3.0
3.	Paddybean	RBS-53	1.07
4.	Blackgram	KU-8-613	1.73
5.	Mungbean	KM-8-228	1.06
6.	Groundnut	FESEG-10	3.17
7.	Toria	TS-38	1.1
8.	Linseed	Sweta	1.04
9.	Pea	Azad	1.2

Paddy Establishment Methods:

To evaluate the effect of different crop
establishment methods and nutrient
management practices in transplanted
paddy, a field experiment was conducted
in *kharif* season of 2011-13. From the
study, it can be concluded that
intermediate practice of ICM (Integrated
crop management) has greater potential
than SRI and CRC because ICM
produced higher yield and profitability.



SRI

ICM

CRC

Jhum Improvement:

Two *jhum* fields were selected in
Medziphema and Jharnapani and three
systems were compared viz. agri-silvi-
livestock, agri-horti-silvi and traditional

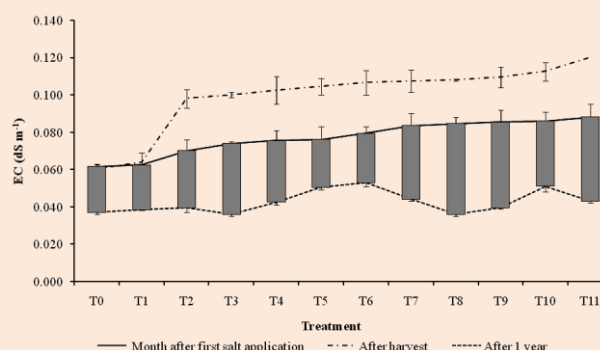
jhum. Contour bunds by using wooden log (locally known as 'Echo') were constructed to prevent soil loss. Pits were made to plant fruit crops and some pits were left out as a water recharge trench. In an area of 0.21 ha in each system the harvest (kg) in traditional *jhum*, agri-silvi-livestock and agri-horti-silvi in a farmer's field in Medziphema is tabulated as under:

Crop	Harvest (kg)	Crop	Harvest (kg)
Traditional <i>jhum</i>		Agri-horti-silvi	
Paddy (<i>Lokhomo</i>)	675.0	Beans	4.0
Sticky Paddy	100.0	Chilli	3.5
Maize	53.0	Bitter Gourd	12.5
Colocasia	12.0	Pumpkin	104.0
Local Pumpkin	51.0	Local long bean	147.0
Agri-silvi-livestock		Colocasia	15.0
Colocasia	31.0	Maize	65.0
Maize	76.0	Cucumber	3.0
Tree sapling	-	Tree sapling	-

Salt Application in *jhum*:

An experiment was conducted for upland paddy with control (T_0), weedy check (T_1), different doses of salt application, viz. 20 (T_2), 40 (T_3), 60 (T_4), 80 (T_5), 100 (T_6), 120 (T_7), 140 (T_8), 160 (T_9), 180 (T_{10}), and 200 (T_{11}) kg ha⁻¹ at 45 and 75 DAS. The results revealed that the soil organic carbon (SOC) increased after harvest as compared to SOC in

standing crop, which again decreased after a year even lower than initial SOC. On the contrary, available N, P and K decreased continuously during the crop growth period as well as in *jhum* fallow period. Application of common salt do not exert any influence on pH, organic carbon and available NPK, however the electrical conductivity increased for a short period (vide figure). In long term, no such effect observed. The yield of paddy was highest in 10 per cent salt application (100 kg ha⁻¹) among the salt treated plots.



Horticulture

Varietal Evaluation of Gerbera:

Seven gerbera varieties viz., Eiko, Ice Queen, Jaffna, Liekie, P. Intenzz, Stanza and Venice were



evaluated in polyhouse for their performance with drip and fertigation. The experiment was laid out in Randomized Block Design with six

replications. The maximum plant height was recorded by Liekie (34.2 cm) and the minimum height was recorded by Ice Queen (26.1 cm). The maximum of 10.5 leaves were found in Liekie and minimum of 8.7 leaves were found in Jaffna. The maximum stalk length was recorded by P. Intenzz (48.9 cm) and minimum stalk length was recorded by Venice (37.2 cm). The maximum neck diameter (0.6 cm), stalk diameter (0.8 cm) and ray floret diameter (11.1) was recorded by Liekie. The maximum trans-floret diameter of 6.3 cm was recorded by Stanza and minimum diameter of 4.8 was recorded by Eiko. The Ice Queen variety did not produce any trans-floret. The maximum disk floret diameter was recorded by P. Intenzz (3.3 cm) and minimum diameter was recorded by Jaffna (2.5). Among the varieties evaluated, the variety Liekie performed better than others.

Rajmabeen Characterization:

Morphological characterization of 32 indigenous rajma beans collected from Zunheboto, Kohima, Phek and Mokokchung were done based on the IPGRI descriptor. Two different types of plant *viz.*, bush type and pole type growth were observed. Out of 32 germplasm, 30 were pole types and two were bush types. The data obtained from the study revealed that the positive



significant variation was observed for the characters *viz.*, plant height (36 – 178.3 cm), no. of inflorescence per plant (1.5 – 3.6), inflorescence length (2.0 – 6.4 cm), no. of pods per inflorescence (1 – 3.6), pod length (7.6 – 17.3 cm), pod width (0.9 – 1.9 cm), no. of locules per pod (4 – 8.5) and yield per plant (4 – 38.3 pods/plant) and the test weight of seeds was ranged from 29.4 g to 56.1 g.

Animal Science

Production Performance of Gungroo:

Adaptability, production and reproduction performance of Ghungroo pig, the first recognized Indian breed was found optimum under Nagaland condition. The lower age at sexual maturity (234.56 ± 15.78 days), weaning to estrus interval (18.87 ± 4.23 days) and high litter size at birth (10.90 ± 0.70) in female and good libido in male were recorded as important physiological trait as compare to exotic (Hampshire) and crossbred pig (Large Black cross).

Artificial Insemination Technique in Pig:

Artificial insemination technique in pig was introduced for the first time in Nagaland. More than 70 per cent conception rate was achieved in double insemination protocol at 24 hours interval with 80 to 100 ml liquid semen.



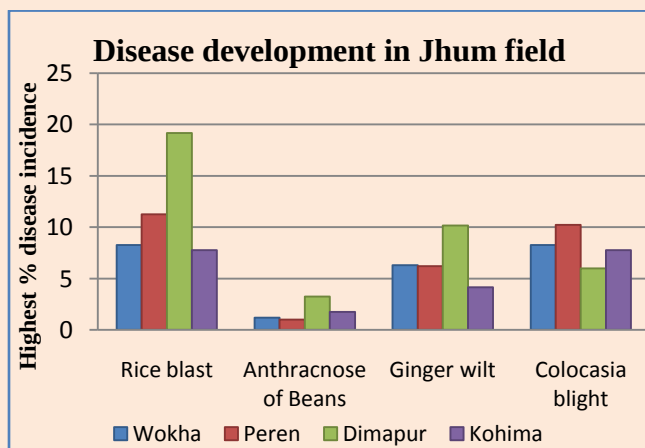
Effect of Egg Weight on Fertility:

Highest fertility and hatchability on total egg set and fertile egg set was recorded in medium weight eggs (52 to 65 g) than light wt (<52 g) and heavy weight (>65 g) in Vanaraja and Gramapriya chicken variety. In medium weight category the egg weight was positively correlated with fertility, hatchability on TES, and hatchability on FES. Incubation of medium weight eggs is recommended for better hatchability and optimum chicks weight at hatch.

Crop Protection

Disease Development in *Jhum* Field:

Among the various factors responsible for low production and productivity in *jhum* lands, diseases contribute to certain extent. The impact of losses caused by diseases is huge in terms of loss of seed material of indigenous crop varieties as well as the loss in yield. Development of diseases in the land use system, as studied in Nagaland, is depicted in the figure below.



Event Organized

World Environment Day:

World Environment Day was celebrated on 5th June to take part



in raising global alertness for taking positive action towards environment. For this, a small function was organized at the down colony, ICAR Complex and its premises. The programme was graced by the presence of the joint director, scientists, technical officers and other staffs of ICAR along with the locals of the nearby villages. The programme was mainly meant for the small children of the ICAR employee and local villagers. Each of them planted one tree sapling, which they will take care till this grown up.

Short course on entrepreneurship development:

ICAR sponsored short course on "Avenues for farmers' Empowerment and Agro-based Entrepreneurship



Agro-based Entrepreneurship

Development” was organized from 20-29th August, 2013. The programme was inaugurated by Dr. Benjongliba Aier, Parliamentary Secretary, Agriculture, Government of Nagaland. 25 participants representing the Assistant Professors and Subject Matter Specialist from the different parts of India attended this course. All together 34 lectures and practical classes were delivered along with the visits to CIH, Medziphema; Mithun farm; and protected cultivation site of ICAR, Jharnapani. In the valedictory function, Prof. B. K. Konwar, Vice Chancellor, Nagaland University, Lumami blessed the programme as the Chief Guest.

Experts meet farmers to discuss on climate change

Expert-farmer meet conducted at Longleng and Wokha districts to get feedback as well as to solve the problems faced by the farming community in their agricultural activities due to the impact of adverse climate.



Naga Kheti Mela-2013

First Naga Kheti Mela was organized in Nagaland by School of Agricultural Sciences and Rural Development (SASRD), Nagaland University in collaboration with ICAR Nagaland centre

and Department of Agriculture, Government of Nagaland at Medziphema during

October 17 – 19, 2013. The programme was organized on the theme “Towards



sustainable agriculture” with three farmers- scientist interactive sessions, exposure visit to research farm of ICAR Research Complex, Nagaland Centre, SASRD, Biocontrol Lab, Medziphema and Central Institute of Horticulture. Four hundred participants including three hundred farmers from Nagaland, representatives from other North-eastern States and Myanmar participated in the three days mela and sixty two stalls were exhibited. ICAR Research Complex, NRC on Mithun, SASRD, NGOs, Central Institute of Horticulture, KVKs, State departments, Self Help Groups and innovators showcased their technologies, farm innovation and processed products.

Transfer of Technology

Collaborative Approach

Training on Integrated Pest Management:

National Centre on Integrated Pest Management, New Delhi and ICAR Research Complex for NEH Region organized a three-day training

programme on Integrated Pest Management in crops important for NEH Region of India at the ICAR, Nagaland Centre, Jharnapani during September 9-11, 2013. The programme was inaugurated by Dr. K.D. Kokate, Deputy Director General (Agricultural Extension), ICAR on 09th September 2013. 47



participants from KVKs, NGOs, State Govt. institutes and progressive farmers of the states, Arunachal Pradesh, Manipur and Nagaland attended the training programme.

Training on Tie and Dye:

Four days NAIP funded training programme on dyeing of locally manufacture



d garments was organized by ICAR in collaboration with the Dept. of Clothing & Textile, AAU, Jorhat during October 07-10, 2013. Six members of a self help group of Lampong Sheanghah village, Mon dist. who were trained earlier in weaving during last year attended this programme to learn the latest techniques of weaving and dyeing of garments.

In-house Approach

Training on home scale horticulture business: an option for entrepreneurship development

Two days training programme on "Home scale horticultur e business:



an option for entrepreneurship development" was organized by ICAR Nagaland Centre, Jharnapani during May 16 – 17, 2013 under Horticulture Mission for Northeast and Himalayan States project. Total of 20 women farmers from Kohima and Dimapur districts were participated in the training programme. Hands on training were imparted on cut flower production, dry flower making, vermicompost production, scientific cultivation of mushroom, pickle making etc. during this two days training programme.

Training on low cost organic mushroom production technology:

ICAR Nagaland Centre with a n objective of "food for all" with nutritional and income security is popularizing its low cost



scientific and organic mushroom production technology at Dimapur, Longleng and Wokha districts, under Tribal Sub Plan project.

Pig Breeding through Artificial Insemination:

A training program was organized under Mega Seed Project on Pig in collaboration with



Nagaland Pig Farmers' Association (NPFA) and Confederation of Naga Farmers' Union (CONFU) at ICAR Research Complex for NEH Region, Nagaland Centre, during Dec 4-6, 2013. Twenty seven participants from eight districts of Nagaland participated in the hands on training on 'Pig breeding through artificial insemination technique'. Six theories and seven practical sessions were organized on semen collection and preservation, breeding, feeding, healthcare and reproductive disease management by learned resources persons.

New Initiative

Seminar:

ICAR Nagaland Centre took a skill upliftment initiative by organizing seminar on first Saturday of every month. The major objectives are to

strengthen the knowledge level as well to enhance the delivering style, answering ability of the scientists, SMS, RA, SRF etc.

"Perspectives" in Morung Express:

The institute took a maiden initiative to bring out a full page with articles related to agriculture and allied sector in Morung Express on the first Friday issue, page no.7 as *Perspectives* of every month. The articles pertaining to practices, techniques and technologies in agriculture and the allied sector along with weather related agro-advisories have been reaching the stakeholders. The effort have been accepted and appreciated widely as a noble cause towards the farmers. The first issue came out on 2nd August 2013 and 17 articles have been published since then.

Activities of Krishi Vigyan Kendra

KVK-Dimapur

Received Best KVK Award:

KVK, Dimapur was awarded the Outstanding KVK Award for the year 2012 by ICAR Research Complex for NEH Region, Barapani, Umiam,



on the occasion of Institute foundation day on 9th January 2013. Shri. Kolom Rabi, SMS (Plant breeding) KVK, Dimapur was awarded the best Technical worker Award for ICAR Complex Nagaland centre for 2012 on 9th January 2013.

Toria covers 250 ha as a second crop after paddy/maize:

KVK-Dimapur took a challenge to raise a second crop after paddy/maize in the district.



Toria (TS-38) was grown on 250 ha area covering 16 villages covering 4 blocks. 219 farmers were benefitted from this activity under TSP programme.

KVK- Wokha

Integrated farming system model:

Three IFS models like Agriculture + Horticulture + Pig + Duck + Fish, Agriculture + Pig + Duck + Fish + Vermicompost, Agriculture + Goat + Duck + Fish + Apiary have been developed at Liphanyan, Koio and Longsachung villages of Wokha district respectively. In these models, the pig breeds like Large Black, Hampshire cross and large white Yorkshire cross; Duck breed 'Cherra Chamli'; goat breed 'Beetle and Assam hill goat' cross and fish breeds like roguer, catla, silver carp, common

carp, and grass carp were distributed to the farmers. Paddy, maize and toria are the main components of agriculture and arecanut, mango and banana are the main components of the horticulture.

Soil nutrient status of Wokha district:

Three hundred and seventy four surface soil samples (0-20 cm) were collected from seventy eight villages of wokha district representing five different blocks (wokha, bhandari, chukitong, sanis and ralan) consisting of four land use pattern viz. forest, *jhum*, cultivated fallow and WTRC. All the composite soil samples were collected in between April-June 2013. Block wise soil test results (mean value) for the micronutrients are tabulated as under. Maximum DTPA extractable Fe, Mn, and Cu were observed at Sanis and Zn at Wokha .

Block name	DTPA Fe (mg/kg)	DTPA Mn (mg/kg)	DTPA Cu (mg/kg)	DTPA Zn (mg/kg)
Wokha	4.96	2.71	1.26	1.02
Bhandari	5.28	2.67	1.24	0.72
Chukitong	4.55	1.94	0.92	0.55
Sanis	5.55	2.74	1.39	0.69
Ralan	5.04	2.69	1.24	0.64

Demonstrations on Paddy-Toria double cropping:

Large scale demonstration on paddy-toria double cropping system was

initiated at Ralan block of Wokha district covering an area of about 60 ha. Immediately



after harvesting of paddy, the improved toria varieties like TS 36 and TS 38 were sown in the field to increase the cropping intensity, and system productivity. An average of yield of 8 q/ha was harvested from the two improved varieties of toria. By seeing the potential and benefit of paddy-toria cropping system, the farmers are interested to adopt this technology for the coming years with short and medium duration paddy varieties followed by toria.

KVK-Longleng

Trainings and Demonstrations:

Total sixty six nos. of training were organized under different disciplines of Agronomy, Horticulture, Animal Science, Plant Protection, Soil Water Conservation Engineering, Plant Breeding and Home Science. Total 1946 nos. of participants (farmers and SHG members) from Hukphang, Pongching, Namching, Orangkong, Bhumnyu, Yongam, Pongo and Longleng Town villages were attended in the training programme.

Sl. No	Discipline	Tr/ Demo (nos.)	Participants (nos.)	Village
1.	Agronomy	12	285	Hukphang, Pongching, Namching, Orangkong, Bhumnyu, Yongam, Pongo and Longleng Town
2.	Horticulture	6	183	
3.	Animal science	16	425	
4.	Plant protection	9	276	
5.	SWCE	9	225	
6.	Plant Breeding	3	75	
7.	Home science	11	293	
Total		66	1946	

Registration of farmers' varieties with PPV & FRA:

Three nos. of farmers' varieties of paddy (var.

Toiya, *Toiha*, *Nukgau*) and one no. of Maize (var. *Kapsho*) from Hukphang, Pongching and Pongo village of Longleng



district were registered under PPV & FRA on 15th November, 2013 at ICAR Research Complex for NEH Region, Jharnapani, Nagaland.

Distinguished Visitors

- Dr. Benjongliba Aier, Parliamentary Secretary (Agriculture) & Chairman, Nagaland State Agril. Marketing Board Govt. of Nagaland, Kohima visited on 20th August 2013.
- Dr. R.K. Pal, Director NRC on Pomegranate Solapur, visited on 24th August 2013.
- Dr. H.C. Bhattacharya, Director, Extension Education, Assam Agricultural University, Jorhat visited on 29th August 2013.
- Prof. B. K. Konwar, Vice Chancellor, Nagaland University, Lumami visited on 29th August, 2013.
- Mr. D.C. Banerjee, Senior consultant, Ag. & R.D. SNRMCD New Delhi, visited on 8th September 2013.
- Dr. K.D. Kokate, DDG (Agril. Extension) ICAR New Delhi visited on 9th September 2013.
- Dr. C. Chattopadhyay, Director, NCIPM (ICAR), New Delhi- 110012 visited on 11th September 2013.
- Dr. K.R. Dhiman, former VC UHF, Solan, Himachal Pradesh, consultant

IAUA New Delhi visited on 25th September 2013.

- Dr. R.R. Hanchinal, Chairperson, Protection of Plant Varieties & Farmers Rights Authority, Ministry of Agriculture, Govt. of India New Delhi visited on 15th November 2013.
- Dr. B. Gangwar, Director, Project Directorate for Farming Systems Research (ICAR) Modipuram, Meerut-250110 U.P. visited on 6th December 2013.

Publications

Research paper:

Chatterjee, D, Datta, S. C and Manjaiah, K. M (2013). Clay carbon pools and their relationship with short-range order minerals: avenues to mitigate climate change? *Current Science* **105**(10): 1404-1410.

Kumar S, Kumar R and Om H. (2013). Studies on Shelf life of *Trichoderma viride* in talc and charcoal based formulations. *Indian Journal of Agricultural Sciences* **83** (5): 566-569.

Kumawat N, Singh R P and Kumar R. (2013). Productivity, economics and water use efficiency of rainfed pigeonpea + black gram intercropping as influenced by integrated nutrient management. *Indian Journal of Soil Conservation* **41** (2): 170-176.

Kumawat N, Singh R P, Kumar R and Om H. (2013). Effect of integrated nutrient management and pigeonpea + blackgram intercropping on productivity, economics and water use efficiency of rainfed pigeonpea. *Indian Journal of Agronomy* **58** (3): 109-115.

Patra, M.K., Kumar H. and Nandi, S. (2013). Neutrophil functions and cytokines expression profile in buffaloes with impending postpartum reproductive disorders. *Asian Australasian Journal of Animal Science* **26**(10): 1406-1415.

Thirugnanavel, A., Deka, B.C., Rangnamei, L. and Chakruno, M. (2013). Genetic diversity of taro (*Colocasia esculenta* L.) in Mon district, Nagaland, needs attention for its conservation. *Current Science*, **105** (8): 1036-1037.

Wanshnong R.K., Thakuria D., Sangma C.B., Ram V., Bora P.K. (2013) Influence of hill slope on biological pools of carbon, nitrogen, and phosphorus in acidic Alfisols of citrus orchard. *Catena* **111**: 1-8.

Books/Compendium:

Chatterjee, D. and Ezung, N. K. (Eds.) (2013). Resilient *jhum* cultivation through integrated farming system.

ICAR RCNEH, Nagaland Centre, Jharnapani, Medziphema, Nagaland.

Deka, B.C., Chatterjee, D., Sahoo, B., Patra, M. K., Thirugnanavel, A., Kumar, R., Krose, M., Bhatt, B. P. and Ngachan, S.V. (2013). Soil-Water-Plant-Animal-Society continuum approach for livelihood improvement of Konyak tribe of Mon in Nagaland. ICAR RCNEH, Nagaland Centre, Jharnapani, Medziphema-797 106, Nagaland.

Deka, B.C., Patra, M.K., Thirugnanavel, A., Chatterjee, D., Borah, T.R., Kumar, Rakesh (2013). Compendium on "ICAR Sponsored Short Course on Avenues for farmers' empowerment and agrobased entrepreneurship development". ICAR RCNEH, Nagaland Centre, Medziphema, Nagaland.

Kolom Rabi, Singh R. Ch., Borah T.R. and Deka B.C. (2013). Seed Production and distribution under TSP in Nagaland. Published by Director, ICAR Research Complex for NEH Region, Umiam 793103, Meghalaya.

Pfukrei K., Borah, Tasvina R. and Deka, B. C. (2013) Seed production in Nagaland. Published by Joint Director, ICAR RCNEH, Nagaland Centre, Jharnapani, Medziphema, Nagaland – 797 106.





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